

	XML Schema1	Int	Float	XML Schema2	String
Row 1	Column 1	Column 2	Column 3	Column 4	Column 5
Row 1	XML Instance 1	1	0.1746	XML Instance a	“storage”
Row 2	XML Instance 2	7	0.23232	XML Instance b	“of”
Row 3	XML Instance 3	3	0.14159	XML Instance c	“strings”

A RELATIONAL DATABASE STORING
XML INSTANCES

FIGURE 1 - Prior Art

<i>namespace URI</i>	201
“ http://www.microsoft.com/xquery ”	210
“”	220
“foo”	230

SQL XML Schema Collection Identifier DB.RelSch.foo

FIGURE 2

CREATE XML SCHEMA COLLECTION <SqlID> AS <expression> [<expression>...]

FIGURE 3

```
1. CREATE XML SCHEMA COLLECTION mssql1ID1 AS
'<schemaman xmlns="http://www.w3.org/2000/10/XMLSchema" targetNamespace="http://
www.w3.org/namespace/"> 401
<element name="TOP">
<complexType>
<attribute name="name" type="string" use="required" />
<attribute name="value" use="default" value="no">
<simpleType>
<restriction base="string">
<enumeration value="yes" />
<enumeration value="no" />
</restriction>
</simpleType>
</attribute>
</complexType>
</element>
</schemaman>'
```

402

403

Schema Components

FIGURE 4

501

```

<include
  id = ID
  schemaLocation = anyURI
  {any attributes with non-schema
  namespace . . .}
  Content: (annotation?)
</include>

```

FIGURE 5

```

<redefine
  id = ID
  schemaLocation = anyURI
  {any attributes with non-schema namespace . . .}
  Content: (annotation | (simpleType | complexType | group |
attributeGroup))*
```

FIGURE 6

```

<import
  id = ID
  namespace = anyURI
  schemaLocation = anyURI
  {any attributes with non-schema namespace . . .}
  Content: (annotation?)
</import>

```

701

FIGURE 7

The diagram illustrates an XML schema structure with annotations:

```
1. ALTER XML SCHEMA COLLECTION msSqlID1 ADD '<scheman XMLns="http://www.w3.org/2000/10/XMLSchema" targetNamespace="http://www.w3.org/namespace/">
```

Annotations:

- Annotation 810 is associated with the `ALTER XML SCHEMA COLLECTION` command.
- Annotation 820 is associated with the `targetNamespace` attribute.
- Annotation 802 is associated with the `element` element.
- Annotation 801 is associated with the `complexType` element.
- Annotation 800 is associated with the `simpleType` element.

```
<element name="BOTTOM">
  <complexType>
    <attribute name="name" type="string" use="required" />
    <attribute name="value" use="default" value="no" />
    <simpleType>
      <restriction base="string">
        <enumeration value="yes" />
        <enumeration value="no" />
      </restriction>
    </simpleType>
  </attribute>
  </complexType>
</element>
</scheman>'
```

FIGURE 8

910
ALTER TABLE <table_name>
ALTER COLUMN <column_name> XML [<SqlID>] [NULL | NOT NULL]
901
920

FIGURE 9

1010
ALTER TABLE products
ALTER COLUMN manufacturing_steps XML (msSQLID1) NOT NULL
1001
1020

FIGURE 10

1110
ALTER TABLE products
ALTER COLUMN manufacturing_steps XML NULL
1101

FIGURE 11

```
1220          1210
  \         /
DROP INDEX xml_index ON products
  \         /
ALTER TABLE products          1230
  \         /
ALTER COLUMN manifest (msSqlID2) XML -- this retypes the column
CREATE XML INDEX xml_index ON products (manifest)
  \         /
  \         1201
```

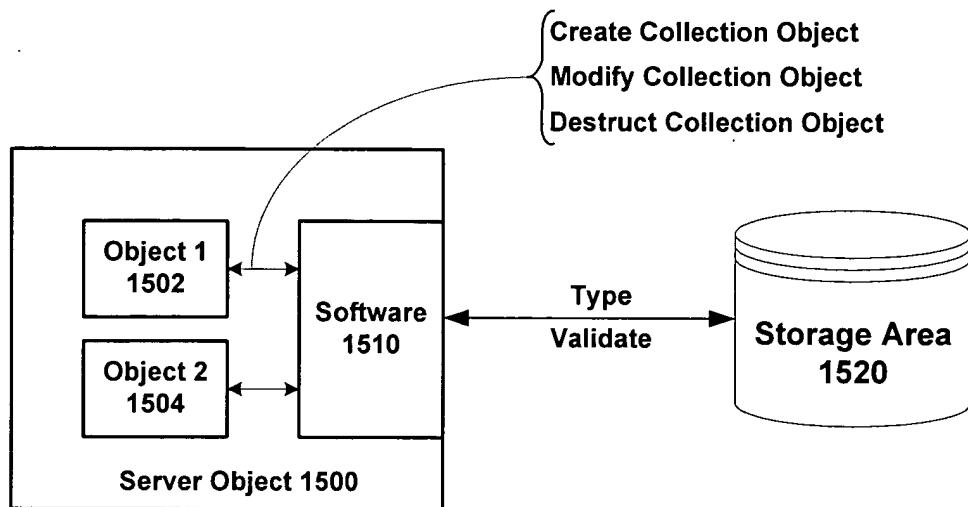
FIGURE 12

1. xml = <http://www.w3.org/XML/1998/namespace>
2. xs = <http://www.w3.org/2001/XMLSchema>
3. xsi = <http://www.w3.org/2001/XMLSchema-instance>
4. fn = <http://www.w3.org/2002/11/xquery-functions>
5. xdt = <http://www.w3.org/2003/02/xquery-datatypes>

FIGURE 13

```
sql = urn:schemas-microsoft-com:xml-sql
sqltypes = http://schemas.microsoft.com/sql/2002/types
```

FIGURE 14

**FIGURE 15A**

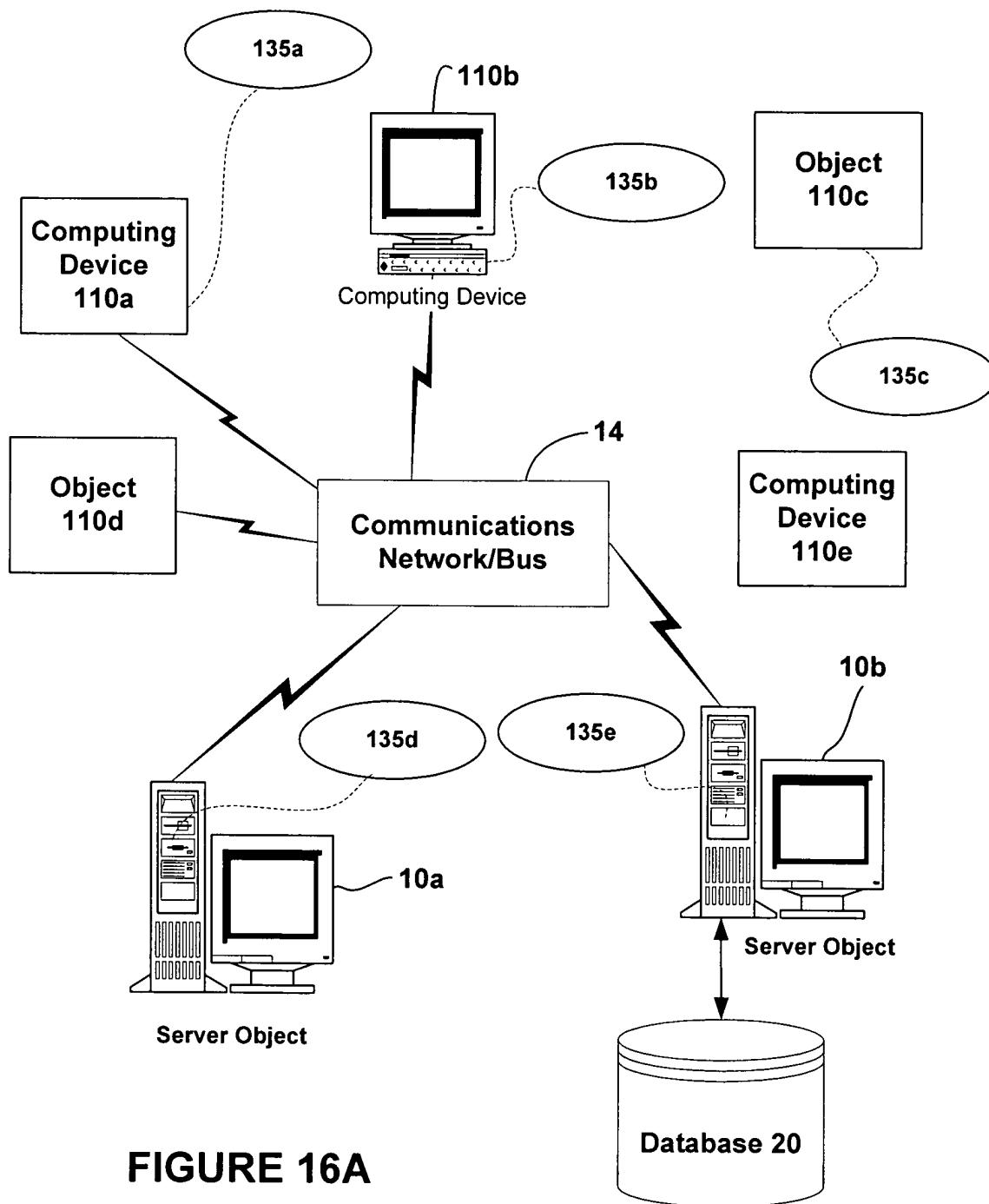
XML Schema Collection Object

	Column 1	Column 2	Column 3	Column 4	Column 5
Row 1	XML Instance 1	1	0.1746	XML Instance a	"storage"
Row 2	XML Instance b	7	0.23232	XML Instance b	"of"
Row 3	XML Instance c	3	0.14159	XML Instance c	"strings"

Annotations for XML Schema Collection Object:

- Column 1: XML Schema1
- Column 2: Int
- Column 3: Float
- Column 4: XML Schema2
- Column 5: String

FIGURE 15B

**FIGURE 16A**

Computing Environment 100

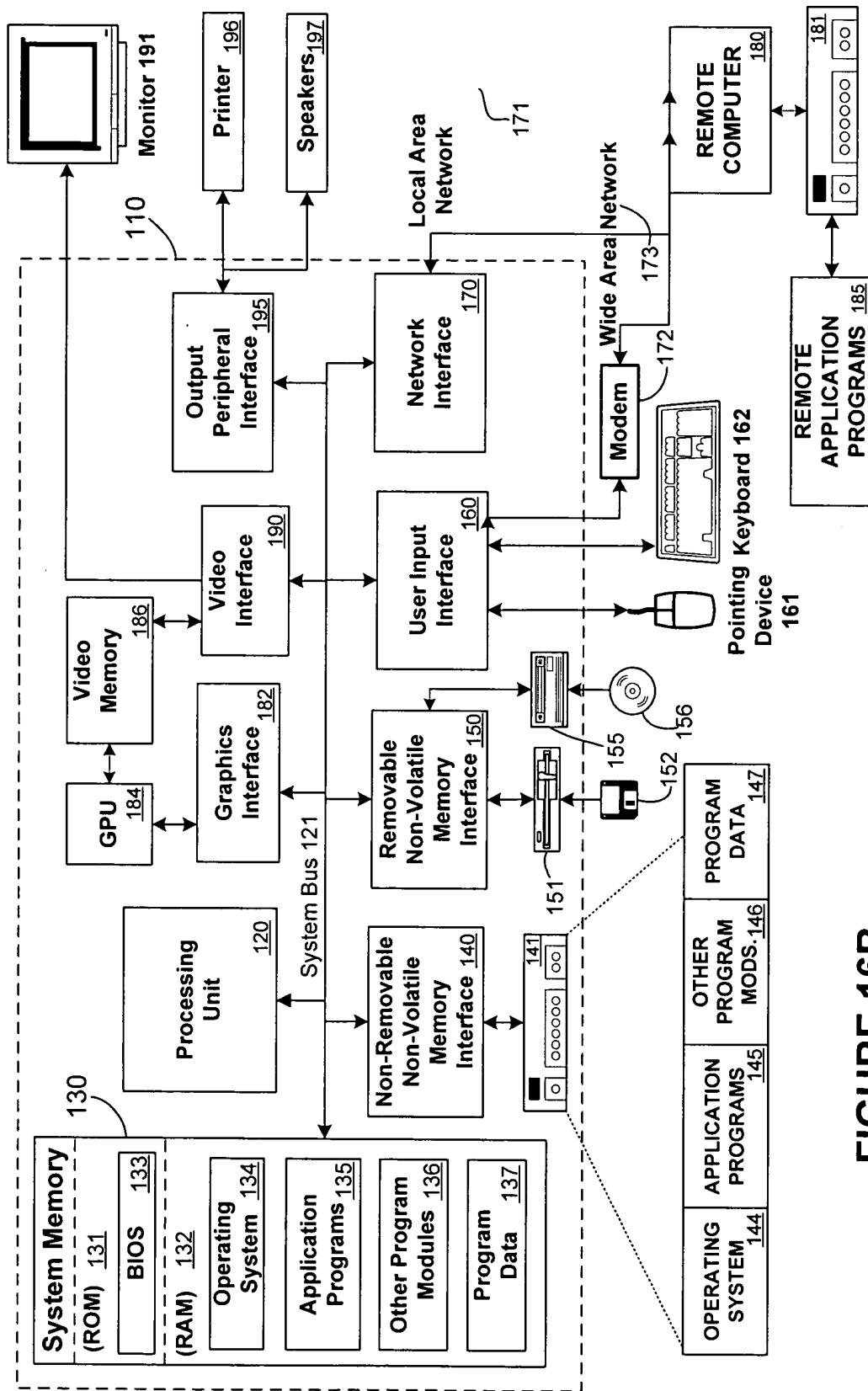


FIGURE 16B

Computing Environment 100

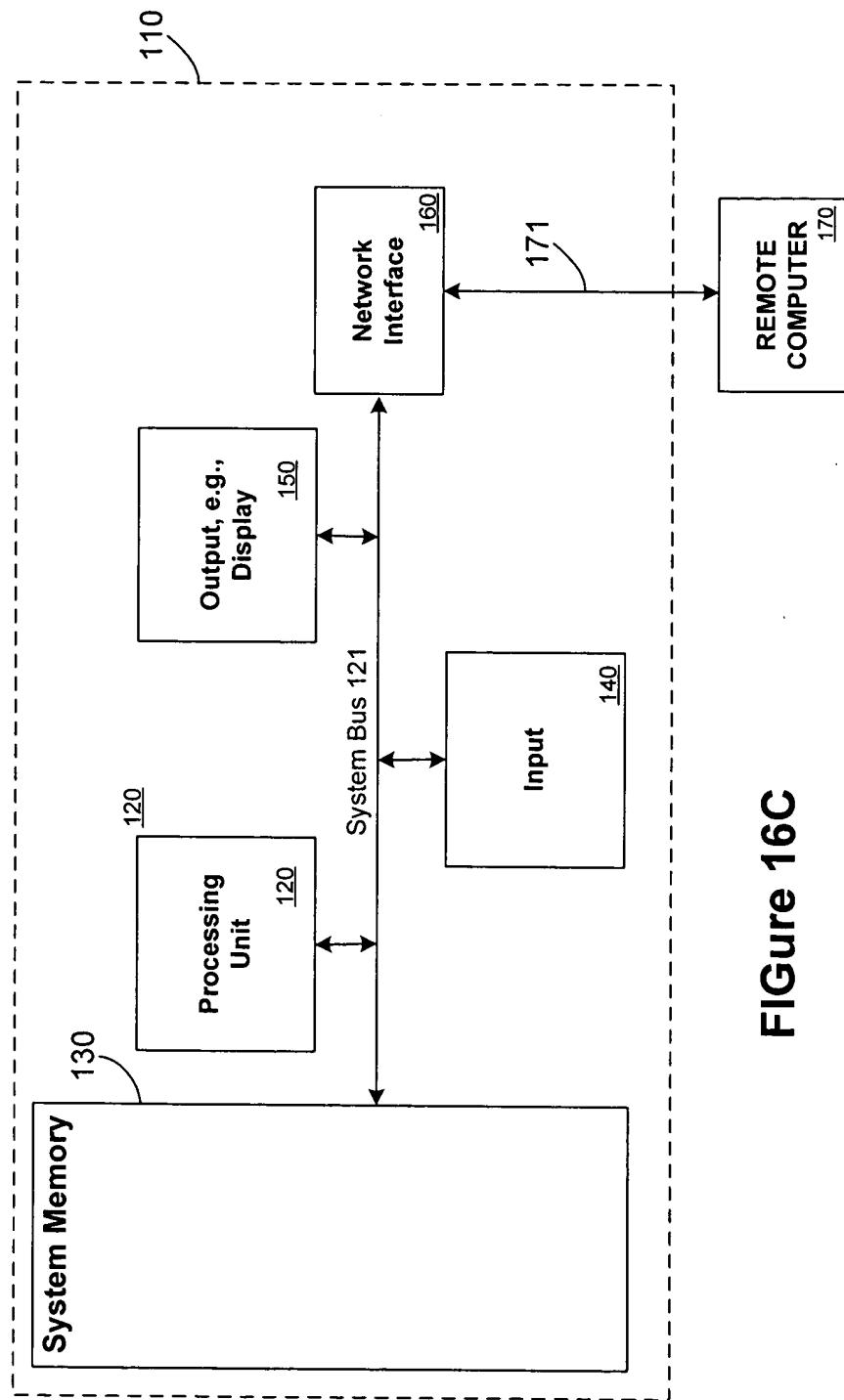


FIGURE 16C